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IS 2367 (1981): Test chart for box type vertical drilling machines [PGD 3: Machine Tools]

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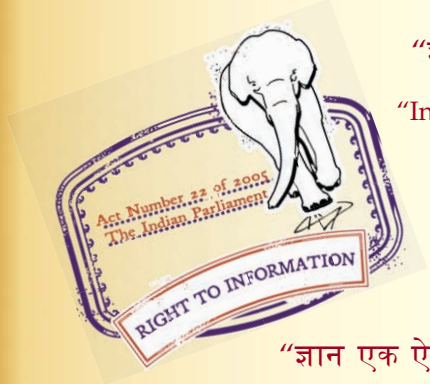

"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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Indian Standard

TEST CHART FOR BOX TYPE VERTICAL DRILLING MACHINES

(First Revision)

Machine Tools, Machine Tool Elements and Woodworking Machines Sectional Committee, EDC 11 [Ref : Doc : EDC 11 (2902)]

1. Scope — Describes both geometrical and practical tests on general-purpose and normal-accuracy box-type vertical drilling machines, and the corresponding permissible deviations with reference to IS : 2063-1962 ' Code for testing machine tools '.

1.1 It deals only with verification of accuracy and applies neither to the testing of the running of the machine (vibrations, abnormal noises, stick-slip motion of components, etc) nor to the machine characteristics (speeds, feeds, etc) which shall generally be checked before testing the accuracy.

2. Preliminary Remarks

2.1 To apply these tests, reference shall be made to IS : 2063-1962 especially for installation of the machine before testing, warming up of spindles and other moving parts, description of measuring methods and recommended accuracy of testing equipment.

2.2 The sequence in which the geometrical tests are given is related to the sub-assemblies of the machine and does not define the practical order of testing. In order to make checking or mounting of instruments easier, tests may be carried out in any convenient sequence.

2.3 When inspecting a machine, it is necessary to carry out all the tests described in this standard, excepting those tests which may be omitted in mutual agreement between buyer and manufacturer.

2.4 When establishing the tolerance for a measuring range different from that indicated in this standard (*see* **2.3.1.1** of IS : 2063-1962), it shall be taken into consideration that the minimum tolerance is 0·01 mm. For any proportional value, the calculated value shall be rounded off to the nearest 0·005 mm. However, the least count of all measuring instruments need not be finer than 0·01 mm.

2.5 Whenever alternate methods of testing are suggested, the choice of actual method of testing is left to the manufacturer.

2.6 For the purpose of this standard, various methods of expressing permissible deviation are employed, each having a particular type of application. The methods employed are as follows:

a) 000/000 for deviations of perpendicularity which are ratios;
b) 000 for any length of 000 for deviations of straightness and parallelism; this expression is used in fact for local permissible deviation, the measuring length being obligatory; and
c) 000 for 000 for deviations of straightness and parallelism; this expression is used to recommend a measuring length but in this case the proportionality rule comes into operation if the measuring length differs from those indicated.

3. Testing Instruments — The testing instruments shall be of the approved type and shall be calibrated at a recognized temperature conforming to the relevant Indian Standards.

4. Accuracy Requirements — The tests to be carried out, the instruments required, the maximum permissible deviations and the manner of carrying out the tests shall be as detailed in the test chart.

EXPLANATORY NOTE

This standard was first published in 1963. Subsequent to the publication of ISO/2772, the committee responsible for the preparation of this standard decided to revise this standard. The revised standard is in line with ISO /2772/I - 1973 ' Test conditions for box type vertical drilling machines — Testing of the accuracy — Part I : Geometrical tests '; and ISO/2772/II - 1974 : ' Test conditions for box type vertical drilling machines — Testing of the accuracy — Part II : Practical test', issued by the International Standards Organization.

Adopted 29 July 1981

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Gr. 4

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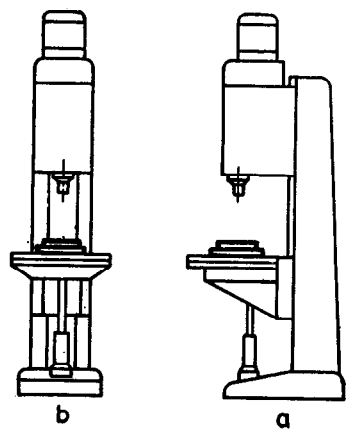
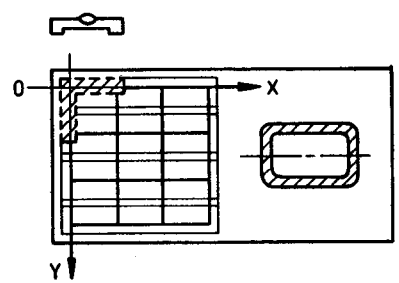
TEST CHART FOR BOX TYPE VERTICAL DRILLING MACHINES

I GEOMETRICAL TESTS

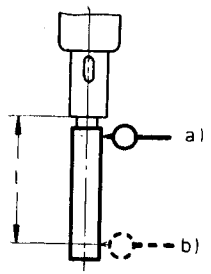
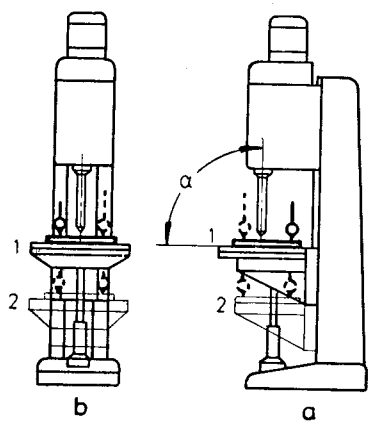
All dimensions in millimetres.

Type..... Customer.....

Machine No. ..... Order No. ..... Date..... Inspector.....

Sl No.	Figure	Object	Measuring Instruments	Reference to IS : 2063-1962 and/or Instructions for Testing	Permissible Deviations	Actual Error
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1		Levelling of the machine. a) In the plane of symmetry of the machine b) In the plane perpendicular to the plane of symmetry of the machine and passing through the spindle axis	Level and straight-edge	**3.3**, **3.3.1**, **3.3.2**, **3.3.3** and **5.1.1.2**(b)	0·03/300	
		A — Table				
2		Flatness of the table surface and of the base plate if it is machined	Precision level or straight-edge and gauge blocks	**5.2 2.2** and **5.2.2.3**	0·03 for any measuring length of 300 (flat or concave)	

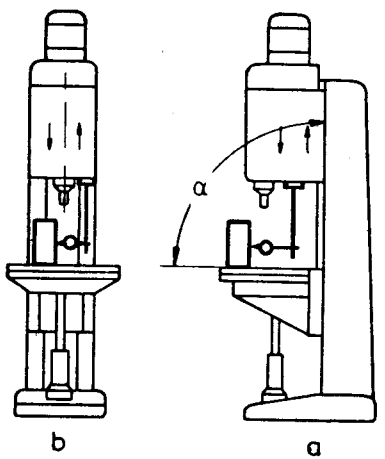
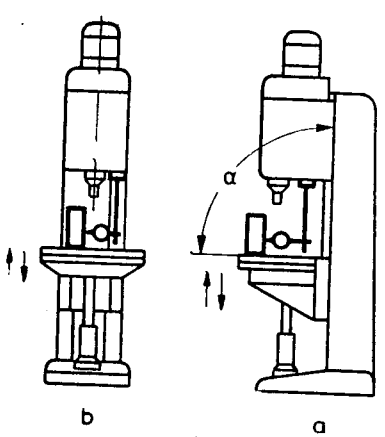
B — Spindle

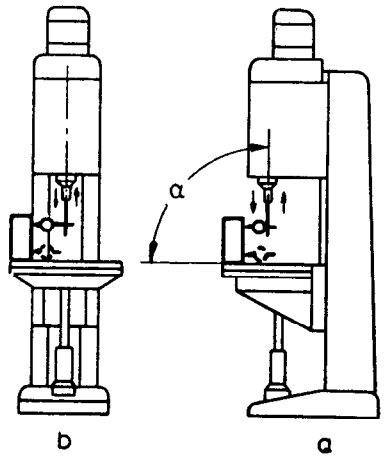
3		Runout of the internal taper of the spindle: a) near the spindle nose b) at a distance of l from the spindle nose	Dial gauge and test mandrel	**5.5.1.2**(b) For details of test mandrels and the determination of the corresponding distance l reference should be made to **A-1**	For $l = 100$ a) 0·015 b) 0·02 For $l = 200$ a) 0·02 b) 0·035 For $l = 300$ a) 0·025 b) 0·05	
4		Straightness of the vertical column ways of the table and squareness of the spindle axis to the table surface: a) in the plane of symmetry of the machine b) in the plane perpendicular to the plane of symmetry of the machine	Dial gauge and straightness	**5.4.1.1**, **5.4.1.1**(b) and **5.1.3.2**(a) Straightness checking to be carried out at a number of positions equally spaced between the extreme positions of the table Squareness checking to be carried out first with the table in the upper position (1) and then in the lower position (2) Spindle head table, cross slide and knee locked	a) 0·05/300* with $\alpha \leqslant 90°$ b) 0·05/300 *Distance between the two points touched.	

(*Continued*)

I GEOMETRICAL TESTS — *Contd*

All dimensions in millimetres.

Sl No.	Figure	Object	Measuring Instruments	Reference to IS : 2063-1962 and/or Instructions for Testing	Permissible Deviations	Actual Error
(1)	(2)	(3)	(4)	(5)	(6)	(7)
	For Machines with Movable Spindle Head Only					
5(a)		Squareness of the table surface to the vertical movement of the knee / spindle head: a) in the plane of symmetry of the machine b) in the plane perpendicular to the plane of symmetry of the machine	Dial gauge and square	**5.4.2.2** Table locked in mid-position Cross slide and knee locked Spindle head locked when taking measurements	a) 0·1/300 with $\alpha \leqslant 90°$ b) 0·1/300	
	Alternate Test for Machines with Fixed Spindle Head					
5 (b)		Squareness of the table surface to the vertical movement of the knee (in three Positions: in the middle/and near extremities of travel): a) in the plane of symmetry of the machine b) in the plane perpendicular to the plane of symmetry of the machine	Dial gauge and square	**5.4.2.2** Table and cross slide locked in mid position Knee locked when taking measurements	a) 0·1/300 with $\alpha \leqslant 90°$ b) 0·1/300	

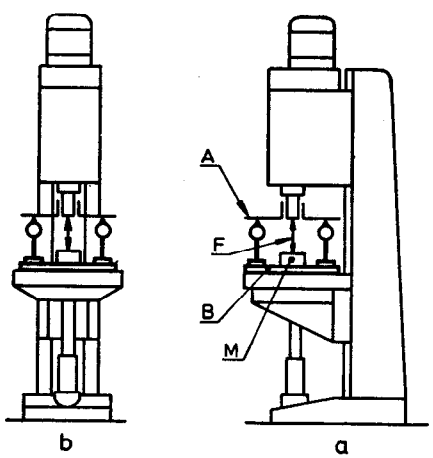
6		Squareness of the table surface to the vertical movement of the spindle housing or quill: a) in the plane of symmetry of the machine b) In the plane prependicular to the plane of symmetry of the machine	Dial gauge and square	**5.4.2.2** Table locked in mid position Spindle head, cross slide and knee locked	a) 0·1/300 with $\alpha \leqslant 90°$ b) 0·1/300	

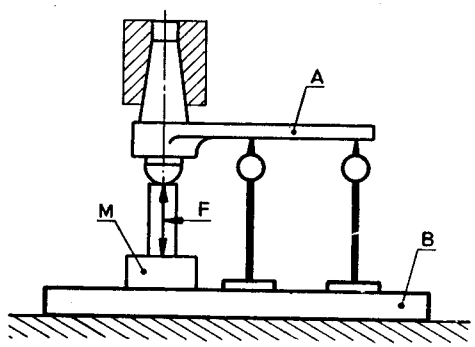
TEST CHART FOR BOX TYPE VERTICAL DRILLING MACHINES
II PRACTICAL TESTS

All dimensions in millimetres.

Type..... Customer.....

Machine No. ..... Order No. ..... Date..... Inspector.....

Sl No.	Figure	Nature of Test	Measuring Instruments	Reference to IS : 2063-1962 and/or Instructions for Testing	Permissible Deviations	Actual Error
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	 A	Measurement of deflection of the spindle axis from its position square with the table under an axil force applied to the spindle: a) in the plane of symmetry of the machine b) in the plane perpendicular to the plane of symmetry of the machine	Special equipment Dial gauge and load cell	It is unnecessary to follow the test code IS : 2063 A drilling test shall not be carried out but an axial force *F* shall be exerted on the spindle nose, using the table surface as a support The application of force *F* and the measurement of the deflection under load of the axis of the spindle in relation to the table surface shall be made directly on the spindle nose with the aid of special equipment '*A*' mounted directly on the spindle nose. The base *B* of the load cell shall be of sufficient area and rigidity to eliminate any deformation of the table	1/1000	

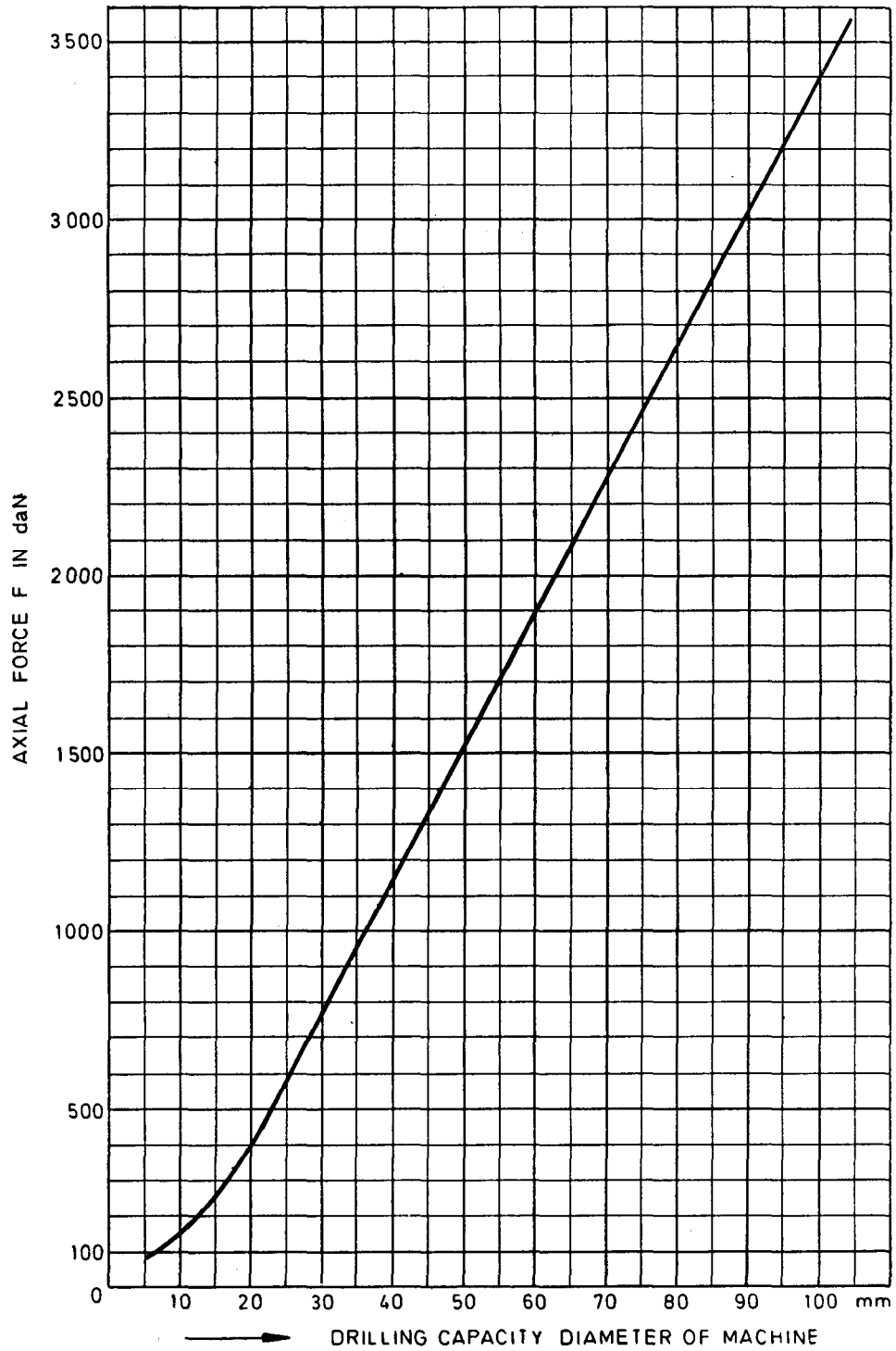
	Special Equipment (Alternate)					
2	 B			The value of force *F* to be exerted shall be specified by the manufacturer. In the absence of a specified load, reference shall be made to the graph given in Appendix A to determine the load as a function of the drilling capacity ϕ of the machine Spindle retracted. Spindle head (for machines having a spindle head adjustable in height) table, cross slide and knee shall be locked in mid-position on their respective slideways A calibration sheet of the test instrument *M* should be supplied		

APPENDIX A

GRAPH GIVING THE AXIAL FORCE *F* AS A FUNCTION OF THE DRILLING CAPACITY DIAMETER OF MACHINE

(Practical Test No. 1)

Note — This graph only gives typical values representing average thrusts when drilling medium steel (Tensile strength $R = 0{\cdot}55$ to $0{\cdot}65$ GPa*) with freshly sharpened drills.



Note — For $\phi > 25$ mm, the graph is approximately rectilinear.

* Provisional value : $R = 55$ to 65 h bar.

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